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shores of Labrador. So, too, of mosses, which a good authority of that day was eager to receive from me and name. And not a few were the new species of fungi found among my gatherings by Dr. Peck. To search out these classes of plants through the winter woodlands, when the fall of the leaves of other plants had made them conspicuous, afforded many a day of rarest pleasure.

It were going beyond the limits of my subject to tell of extended trips made during these years to the White Mountains, to join there the Faxons, till we became as familiar with those tempest-swept heights as with our native fields. Or to tell of boat journeys and the ample fruits of such, made in three successive years to the cold fir-set shores of the Lower St. Lawrence; to the Saguenay, low between its palisades of giant cliffs, and through the lone lakes and unbroken forests of the St. Francis to the St. John of northern Maine. Experiences of wild life calculated to fill one with large thoughts, to raise him above fear and to make the modern world of conventions and fads show paltry.

In the fall of 1880, when our thorough survey of these regions was but half completed, I was sent away on forestry service to distant States, and I have ever since wandered further and further on. But year by year I have learned with joy and pride of the achievements since made in this field of my youthful love by you, my associates, who began better prepared than I did (for I was only the first available man). Yet share the secret of success of an old collector, quit the broad plain of dull sameness, seek out every possible situation of exceptional character, and look to find amidst peculiar conditions rare and localized plants.

Reviews.

Cytologische Studien aus dem Bonner botanischen Institut. Jahrbücher für wissenschaftliche Botanik, 30: Heft 2 and 3.

In this collection of papers by Strasburger and his students a powerful impetus has been given to botanical cytology. Through their efforts mitosis in a large number of plant forms is made known, in some cases for the first time. The groups studied include fungi (*Peziza*, *Erysiphe* by Harper, and *Basidiobolus ranarum*

by Fairchild); Algae (*Fucus*, 3 species, by Strasburger, *Stypocaulon scoparium* and *Halopteris* sp.? by Swingle); Characeae (*Chara fragilis*, by Debski); Equisetaceae (*Equisetum limosum*, by Osterhout); Dicotyledons *Podophyllum peltatum*, *Helleborus foetidus*, by Mottier); and Monocotyledons (*Lilium Martagon*, *L. candidum*, *Fritillaria Persica*, by Mottier, and *Hemerocallis fulva*, by Juel). The chief results obtained were in regard to the formation of the mitotic figure, the centrosome, and reduction in the chromatin.

All work connected with the origin and structure of the spindle is based upon Strasburger's idea of kinoplasm (equivalent to Boveri's archoplasm) and trophoplasm. Strasburger himself regards these observations as demonstrating the truth of the idea and he offers still more definite views in regard to the nature of the two substances. The active kinoplasm has a fibrous structure, the active trophoplasm an alveolar structure (Wabenstruktur), but during the resting phases both substances may show only the latter structure. Perhaps the idea of Strasburger's conception of the relations of kinoplasm and trophoplasm is given by his comparison of the former with linin in the nucleus and the latter with chromatin. The nucleolus is regarded as a "reserve store" of kinoplasm and the relations therefore of nucleus and kinoplasm are considered very close. Harper's observation on *Peziza* and *Erysiphe* lead Strasburger to regard the cell membrane also as derived from kinoplasm, while Harper in addition gives to the kinoplasm a certain physiological rôle whereby it acts as a "middle-man" between the outer world and the nucleus.

The origin of the spindle-fibres from kinoplasm, and the formation of the spindle, as described by Osterhout and Mottier, are very extraordinary and are certainly not duplicated in any known animal cells. The kinoplasm, which is indicated by a characteristic color after the use of orange solutions, is first seen as radial fibres stretching out in all directions from the nuclear membrane. The fibrils next become tangential and focussed at various points in the cell, so that a multipolar spindle results. The various poles gradually fuse together until only two are left, and these form the definitive poles of the mitotic figure.

Fairchild describes a very different kind of a spindle in the fungus *Basidiobolus ranarum*. Here it arises, as in the other cases,

by convergence of bundles of spindle fibres, but convergence is not carried so far as in the bipolar types, and the result is a spindle with truncated ends. The bundles of fibres end in knob-like enlargements, which resemble centrosomes. Similar enlargements were observed by Debski at the ends of the spindle-fibres in *Chara fragilis*.

The general upshot of the various observations in regard to the centrosome is that such a body is absent in most forms of plants. Strasburger observes that centrosomes can be demonstrated in thallophytes and bryophytes, but that in pteridophytes and phanerogams the most careful search for them was in vain. If Osterhout's and Mottier's descriptions of spindle formation are correct, the conception of the centrosome as a permanent morphological element of the cell must be given up, at least so far as these plants are concerned. The very interesting observations of Juel add further evidence in this direction, Juel found that mitoses sometimes occur, in which one chromosome becomes isolated either before or after division. It forms a small cell by itself, with perfect cell-plates between it and the large daughter-nuclei. It acts like a cell in all respects; forms a nuclear membrane; passes into the resting state, and even goes so far as to form a complete spindle and to divide by mitosis. Such a case shows that a centrosome is not a necessary element in mitosis, and one must agree with Juel that "those characters which belong to the cell as such are to be found not only in the totality of the chromosomes, but also in each single chromosome."

In several cases the centrosome was very different in form from that found in most animal cells. Harper observed that the centrosome, if present at all in *Peziza* and *Erysiphe*, must be in the form of a thin flattened disc stretching across the somewhat blunt pole. The centrosome nature of the knob-like thickenings in *Chara* and *Basidiobolus* is questioned by Debski and Fairchild.

In regard to the question of chromatin reduction, the most important observations were made by Mottier on certain Liliaceae. In accordance with these results Strasburger gives up his former idea of a purely quantitative division in *Lilium* by a double longitudinal splitting of the chromosomes, and now sustains the view accepted by Haecker, Rückert and others that the second division

is a reducing division in the Weismann sense. The process of reduction in *Lilium* is now regarded by Mottier and Strasburger as follows: the double-spireme of the pollen-mother-cell segments into 12 chromosomes; each double chromosome bends to form a U; each chromosome then splits through the plane of longitudinal division during the first mitosis and the daughter-chromosomes have the form of a V. During the second mitosis each V divides transversely at the angle, a reducing division in the Weismann sense thus taking place. Each of the original double chromosomes has the value of a tetrad, the segregation of the chromatin into the compact solid tetrad being the only step lacking to make the process correspond with Haecker's description of tetrad formation in certain copepods. Tetrads agreeing exactly with those of animal reproductive cells were observed and pictured by Osterhout in the case of *Equisetum*, but it is to be regretted that he offers no observations regarding their mode of origin or their fate.

In many cases the conclusions drawn from the observations brought together in this important collection are not wholly satisfactory. For example, the general denial of the existence of a centrosome in the higher plants cannot be accepted upon the mere statement. Evidence to the contrary is furnished by some of the figures, as in the case of Figure 63, Plate V, where a structure is pictured at the lower pole of a cell of *Helleborus*, which agrees very closely with the centrosomes described by Guignard.

GARY N. CALKINS.

A Flora of Northwest America. Containing brief descriptions of all the known indigenous and naturalized plants, growing without cultivation, north of California, west of Utah and south of British Columbia. By Thomas Howell. Vol. 1, Phanerogamae, Fascicle 1, Ranunculaceae to Rhamnaceae. Price 50 cents. Portland, Oregon. March 15, 1897.

One of the most interesting and welcome contributions to Botany that has recently appeared is, without doubt, the first fascicle of Howell's "Flora of Northwest America."

The author's remark in his preface, that all the territory of the United States of America, south of the British boundary, except Oregon, Washington and Idaho, is supplied with "Floras," is

in a certain sense true. Although we have no local "Floras" that can be called in any sense really good or exhaustive, with the exception, perhaps, of those covering the northeastern part of the continent, all parts of the United States, except the States mentioned, have some publications concerning their flora.

As being the first local flora of the northwestern part of our country, Professor Howell's "Flora" is, therefore, doubly welcome. The territory covered, as indicated by the title, viz., west of Utah, should include the western half of Idaho and a small portion of western Montana. It is doubtful, however, if the "Flora" can be said to represent this region, especially the mountain districts of northern Idaho and western Montana, as their flora is yet comparatively little known, and it is doubtful if Professor Howell has had access to the collections made in the last few years by Sandberg, Leiberger, Heller, McDougal and Henderson, in Idaho, and by R. S. Williams, Professor Kelsey and Frank Tweedy, in Montana.

If the region is limited to Oregon, Washington and a small portion of Idaho, then it is safe to say that none of our local manuals and reports, except those of the northeastern United States, better represents the region covered than does Professor Howell's work. It is well known that the author has spent many years in collecting material for his work, having studied the flora, not only in the herbarium, but also in the field.

In his preface Prof. Howell makes the following humble remarks: "As the writing of descriptions of plants at this late date is, to a great extent, writing or copying what others have previously done, it is hardly right to claim originality for work done in that field, I, therefore, wish to acknowledge here, that I have used the works of Torrey and Gray, . . . and others." In the list given the author has omitted the name of Dr. B. L. Robinson. It is perhaps intended to be included in the words "and others," but if the most important sources are to be given, Dr. Robinson's work, especially as far as the present fascicle is concerned, has more right to be mentioned than that of several given in the list.

Although the descriptions of several species not seen by the author are simply copied, the work can in no way said to be a mere compilation. The individuality of the author shows itself

in more than one way. The following new species are described in the present fascicle: *Ranunculus ciliatus*, *Coptis venosa*, *Delphinium Oreganum*, *Aconitum bulbiferum*, *Roripa Columbiae*, *Arabis furcata*, *A. Koeleri*, *Lepidium reticulatum*, *Silene Gormanii*, *Alsine Simcoei*, *Montia humifusa*, *Sidalcea virgata*, *Geranium Oreganum*, *Limnanthes gracilis*, *L. pumila* and *L. floccosa*.

In the whole fascicle, only six varieties are acknowledged. All others are raised to specific rank. The course taken is, in general, in the right direction. A form that can be well be defined is better regarded as a species, but has not Prof. Howell overdone the matter? If all the rest were made species, why leave those six as varieties?

In raising the varieties to specific rank, Prof. Howell has in most cases, preserved the varietal names, but *Ranunculus occidentalis* Lyallii becomes *R. Greenei*, *Nasturtium terrestre occidentale* Wats. becomes *Roripa Pacifica*, *Silene Douglasii brachycalyx* Robinson becomes *S. Columbia*, *Arenaria Fendleri subcongesta* becomes *A. Burkei*, for what reason is not apparent.

The sequence is, with some modification, the same as that in the Synoptical Flora, and the general arrangement, keys, etc., are somewhat similar. Synonyms are given whenever the author's nomenclature differs from the generally accepted one.

P. A. R.

Synoptical Flora of North America: Vol. I. Part I. Fascicle II. Polypetalae from the Caryophyllaceae to the Polygalaceae. By Asa Gray, LL.D., continued and Edited by Benjamin Lincoln Robinson, Ph.D., with the collaboration of William Trelease, Sc.D., Director of the Missouri Botanical Garden; John Merle Coulter, Ph.D., Professor of Botany in the University of Chicago; and Liberty Hyde Bailey, M.Sc., Professor of Horticulture in Cornell University. (Issued June 10, 1897.)

The prompt appearance of another fascicle of this important work is a gratifying reminder of the continuous activity which, under notably capable direction, steadily draws nearer the goal sought by the ample enterprise and high abilities of Dr. Gray.

The two sections of the work first issued were published by Dr. Gray in 1878 and 1884, being part I. of volume II. and part II. of volume I. comprising the entire Polypetalae. After an in-

terval of eleven years the first fascicle of part I. volume I. appeared in October, 1895, and was reviewed in the *BULLETIN* of the following month. This was edited by Dr. Robinson largely from the manuscript left by Dr. Gray and by his immediate successor Dr. Watson. The fascicle now issued is intended to be bound with fascicle I., the two forming together a volume of 505 pages furnished with a complete index and preliminary key to the orders, here so termed. The whole volume covers forty-five families of Polypetalae from Ranunculaceae to Polygalaceae. A third fascicle now in preparation will include the Leguminosae.

The modern principle of coöperation has entered into the making of the fascicle now before us, and the names of President Coulter, Dr. Trelease and Prof. Bailey add their special authorities to the exposition of several important families. The text of most of the families, however, is credited directly to Dr. Gray, and for the most part appears to have been derived verbatim from his manuscript, revealing unmistakably his effective handiwork in technical description. Prof. Coulter has returned to the Hypericaceae and Dr. Trelease to the Geraniaceae, both authors finding something to add to their former useful monographs, but, be it said in regard to certain points, curiously exposing themselves to attack with their guards down. Prof. Bailey has contributed especially the genus *Vitis*.

Dr. Robinson's own contributions to the work, besides the multifarious and exacting detail of editing, has consisted in the treatment of several special genera and minor families, and more particularly of the extensive and attractive family Caryophyllaceae, and of the Sapindaceae and Polygalaceae. The descriptions are, as a rule, admirable, and it is evident that the later hand has caught much of the clear-cut facility of the master.

We cannot help observing, however, that here and there the treatment of species and genera and, what is of less consequence, their names, seems to betray a proneness to linger within the comfortable precincts once occupied by a sound conservatism under the conditions belonging to a period not yet remote but rapidly passing back into the domain of botanical antiquity. We are hence disposed to arraign the editor for a too conscientious adherence in the interest of conformity to the methods and theories

which controlled the earlier issues of the work nearly twenty years ago. The intervening time in its almost revolutionary upheaval and advance cannot be slighted, and any work of the present day which does not sufficiently recognize it must fail of quite the position it might otherwise attain. The attitude regardant has its graces but also is not without its dangers. If in the present case it has made it the more difficult to discern the value of recent advanced work in discrimination it is all the more regrettable since a major part of such work, at least in phanerogamic botany, has clearly been done in a spirit of conservatism not the less regardful of the truth of nature because moving more freely in the broader lights of the present day.

It may well be questioned whether the idea that a species is after all but a conception of the individual mind has not been carried too far. At best the doctrine expresses only a half-truth and in practice gives a wide range of liberty either destructive or creative according to the bent of each new systematist. More profound even than the phenomena of change and development resulting in intergradation, is the mysterious fact of fixity of type revealing itself in a certain all but invincible individuality. This in many an organism we find surviving the most diverse environments and remaining unperturbed amid a crowding pressure of other types visually so similar that only a practiced eye and understanding can perceive them to be different. A clear apprehension of such facts as these may well give us pause when tempted to discredit the conclusions of any student who may have had greater advantages or employed greater industry than ourselves in the investigation of any particular group. The too ready reduction of critical species which the future will only reinstate can only have the effect of impairing the prestige of an author and limiting the authority of his work.

However inapplicable these strictures may be to very much in the work before us which is incontestably of a high order of excellence, we wish particularly to disclaim their application to the treatment of the genus *Vitis*. This is truly a piece of constructive work of conspicuous merit both in larger modelling and lesser detail. The simple order which has here been resolved out of the veritable bacchanalian confusion into which our grapes had

fallen furnishes an effective illustration of the utility of latter-day practice. The descriptions are the most detailed and lengthy in the volume, perhaps the least technical. It is evident that the author's aim has been not alone to set down the species in formal terms, but to effect in the mind of the intent student some realization of the individuality of the particular species discussed. There is here an escape from the trammels of the labeled sheet to the presence of the living plant, and it is refreshing to find species kept distinct *because they are so*, even though the herbarium may appear to deny it. Professor Bailey knows his species and his own convictions help to carry their realizations into the minds of others.

It must not be understood that here alone in the work facts are held to be paramount to mellowed dicta concerning facts. Elsewhere there is, indeed, a certain inertia of opinion shown here and there which is perhaps justly censurable in some such terms as these. But the progressive spirit, if sometimes dormant, shows itself to be only napping after all and quite capable of an energetic awakening as, for instance, in the case of the genus *Spergularia*, here tenaciously so called. Whatever sacrifice of consistency is involved in the treatment of this group will be criticised by no one viewing the result, which is well and logically worked out. No consensus of opinion will support the author's implied view that the genus represents scarcely more than a single polymorphous species. But this point of view, however oblique, has not been allowed to interfere with a direct and essentially true rendering of the facts. Fourteen species and major varieties are admitted and several minor varieties indicated. Nevertheless it is probably not too much to say that the group will have to be still further enlarged, and that some of the more obscure of the "oft-recurring forms," to use Dr. Robinson's apt phrase, will some day define themselves to us in clearer outlines. It is not probable, for instance, that Professor Greene's species and subspecies have so little power of resistance that they will consent to remain with their faces to the wall as several of them in this genus here find themselves placed.

In connection with the publication of this work should be noted the almost coincident appearance of the second volume of

Professor Britton's and Judge Brown's "Illustrated Flora of the Northern States and Canada." The two works, differing much in scope and purpose, may be taken together as, in some sort, a measure of the widely extended interests and activities connected with the study of our flora which has especially marked the last decade. More than this, they may be understood as being actually an organic part of these very movements—the agency through which a widely diffused subjective interest has found, as inevitably it must have found, its adequate concrete expression.

It is gratifying to note the large measure of accord between the two works; and, after all, most of the points of disaccord may be taken as evidence that our knowledge is still in a formative stage and subject to widely different understandings. But later understandings based on our present lights have so often recently proved to be the correct ones that the generally forward attitude of the "Illustrated Flora" can scarcely fail to make its pages on many points a final court of appeal.

The "Synoptical Flora" covers far the wider field and will be indispensable outside of the boundaries set down for the "Illustrated Flora." Within these boundaries the latter will fill a position of authority and usefulness such as no other publication relating to our flora has hitherto enjoyed.

Certainly no previous period of our botanical history has been enriched with any benefit at all commensurate in proportions and value to that which these works now confer.

E. P. B.

Report on the Coal and Lignite of Alaska. W. H. Dall, 17th Ann. Rept. U. S. Geol. Survey, Part 1, 763–908. *pl.* 48–58 and illust. in text. 1896.

This report contains numerous references to the fossil vegetation found at the various localities, and Appendix I. to the report consists of a complete enumeration of the fossil flora as far as known, together with a table of distribution for both America and the Old World, by Dr. F. H. Knowlton. It is almost entirely of tertiary age.

A. H.